

299-W11-65 (A7307) Log Data Report

Borehole Information:

Borehole: 299-W11-65 (A7307)		Site: 216-T-6 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Not deep enough		GWL Date: 1/13/2003	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
136,642.56 m	567,197.81 m	Oct. 1947	216.301 m	160	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	0.42	8 5/8	8	.3125	+0.42	154
The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS³, and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing. Top of casing is cut unevenly. A reference point survey "X" is located at the top of the casing stickup.

Logging Equipment Information:

Logging System:	Gamma 1D	Type:	SGLS (35%)
Calibration Date:	9/2002	Calibration Reference:	GJO-2002-385-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4/Repeat	
Date	1/15/03	1/16/03	1/21/03	1/21/03	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	35.0	75.0	154.0	48.0	
Finish Depth (ft)	1.0	34.0	74.0	33.0	
Count Time (sec)	200	200	200	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A ⁴	N/A	N/A	N/A	
Pre-Verification	AD046CAB	AD048CAB	AD049CAB	AD049CAB	
Start File	AD047000	AD048000	AD049000	AD049081	
Finish File	AD047034	AD048041	AD049080	AD049096	

Log Run	1	2	3	4/Repeat	
Post-Verification	AD047CAA	AD048CAA	AD049CAA	AD049CAA	
Depth Return Error (in.)	0	-1	N/A	-1	
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 118. During SGLS logging, fine-gain adjustments were not needed to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel. Before log runs 1 and 2 began, the sonde was run up and down the borehole one time to displace any radon gas if present.

Analysis Notes:

Analyst:	Sobczyk	Date:	01/27/03	Reference:	GJO-HGLP 1.6.3, Rev. 0
-----------------	---------	--------------	----------	-------------------	------------------------

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all outside the control limits established on 12/05/2002. The pre-run verification spectra were all above the upper control limit for the 609-keV full-width at half-maximum value. The post-run verification spectra were all below the lower control limit for the 2615-keV peak counts per second. In addition, pre-run verification spectra AD048CAB and AD049CAB were above the upper control limit for the 1461-keV full-width at half-maximum value. Post-run verification spectra AD048CAA and AD049CAA were below the lower control limit for the 1461-keV peak counts per second. The peak counts per second at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 8 and 13 percent lower at the end of each day. Examinations of spectra indicate that the detector functioned (i.e. decreasing efficiency throughout the day's logging) during all of the logging runs, and the spectra are provisionally accepted.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1DSept02.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. On the basis of Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing to total depth (154 ft). The casing correction factor was calculated assuming a casing thickness of 0.3125 in. This casing thickness is based upon the field measurement. A water correction was not needed or applied to the data. Dead time corrections are required when dead time exceeds 10.5 percent. As the dead time did not exceed 10.5 percent, a dead time correction was not needed or applied.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 609 keV was used to determine the naturally

occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 1764 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected near the ground surface (1 to 3 ft) with a maximum concentration of 1.4 pCi/g at 1 ft. ^{137}Cs was detected in the interval from 40 through 43 ft. The range of concentrations was from 0.3 pCi/g to 3.3 pCi/g, which was detected at 41 ft.

Recognizable changes in the KUT logs occurred in this borehole. Changes of 4 pCi/g or more in apparent ^{40}K concentrations occur at approximately 37, 117, 123, 134, and 142 ft. The apparent 4-pCi/g decrease in ^{40}K concentrations at 74 ft occurred because of the change in sensitivity of the tool during logging. The section above 74 ft was logged in the morning while the section below 74 ft was logged at the end of the day. The increase in ^{40}K concentrations at about 37 ft may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. Between 109 and 118 ft, the fine-grained member of the Cold Creek Unit (formerly known as the Early Palouse Soil) is shown by an increase in total gamma (50 cps) and ^{232}Th (0.5 pCi/g). There is about an 8-pCi/g decrease in ^{40}K concentrations in the intervals between 117 through 123 ft and 134 through 142 ft. ^{238}U increases by approximately 2 pCi/g in the interval between 134 and 138 ft. On the basis of low ^{40}K concentrations, the carbonate-rich paleosols of the Cold Creek Unit are interpreted as being in the intervals between 117 and 123 ft and 134 and 138 ft. The caliche layer, with characteristically high uranium content (greater than 2.0 pCi/g), is present between 134 and 138 ft. ^{232}Th decreases by approximately 0.5 pCi/g or more in the interval between 134 and 142 ft.

On the repeat log, the SGLS showed reasonable repeatability except for the following depths: 37, 38, 39, 40, 41, 42, 44, and 46 ft. The ^{40}K concentrations based on the 1461-keV photopeak do not repeat at 37 and 46 ft. The ^{238}U concentrations based on the 609-keV photopeak do not repeat at 39 and 44 ft. The ^{238}U concentration based on the 1764-keV photopeak does not repeat at 41 ft. The ^{232}Th concentrations based on 2614-keV photopeak do not repeat at 38, 39, and 40 ft. The ^{137}Cs concentrations based on the 662-keV photopeak do not repeat at 40 and 42 ft. The cause of these variations is probably due to the detector's decreasing efficiency throughout the day's logging.

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained minor amounts of gamma-emitting contamination as early as 1963 through at least 1976. The logs from 4/26/63 and 5/6/76 detected gamma activity above background at approximately 39 ft (12 m). The SGLS detected ^{137}Cs between 40 and 43 ft.

Comparison log plots of data collected in 1995 by Westinghouse Hanford Company and in 2003 by Stoller are included. The 1995 concentration data for ^{137}Cs are decayed to the date of the SGLS logging event in January 2003. Since 1995, ^{137}Cs activities appear to have decreased as predicted by radioactive decay.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

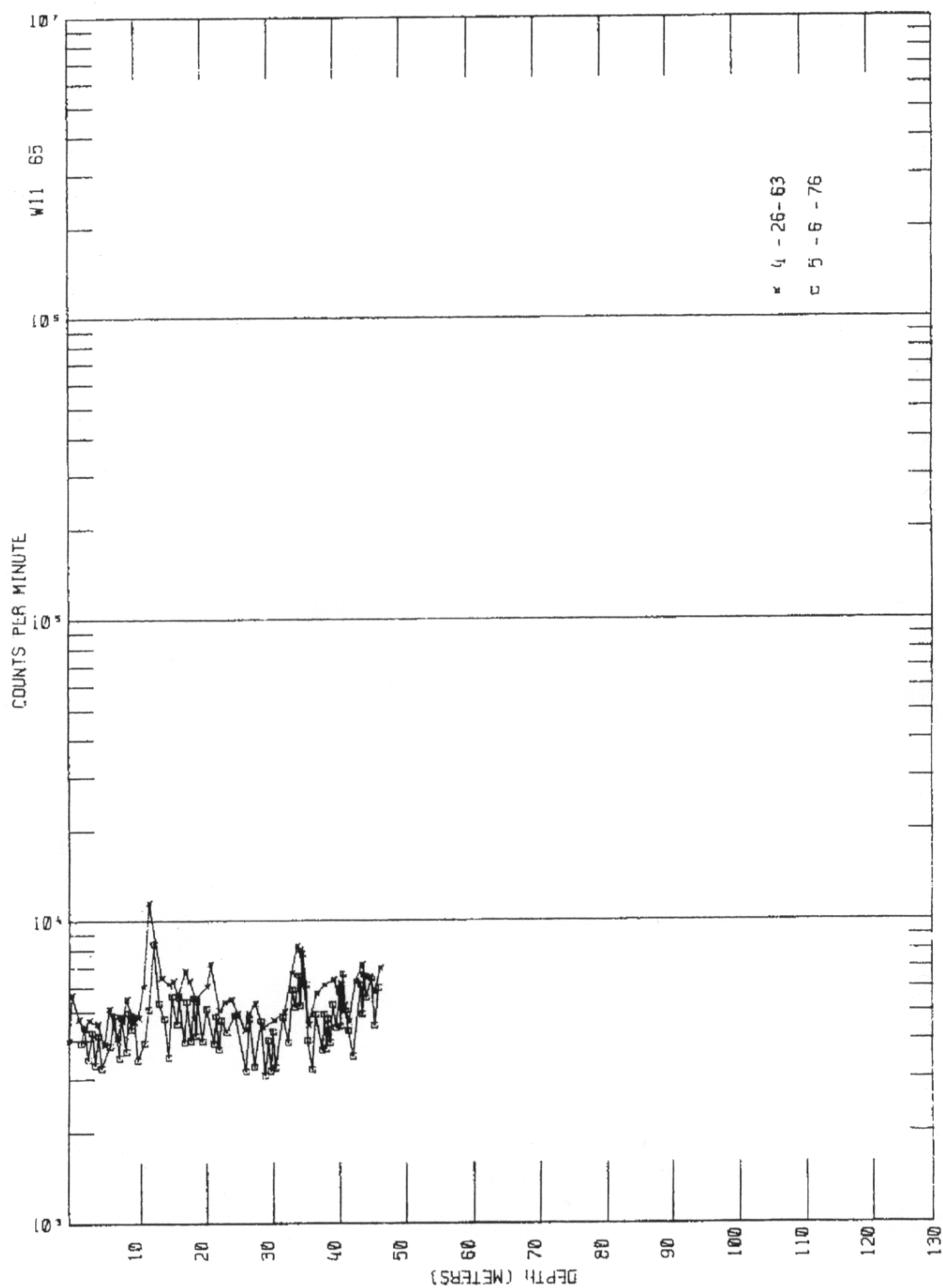
Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

¹ GWL – groundwater level

² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – not applicable

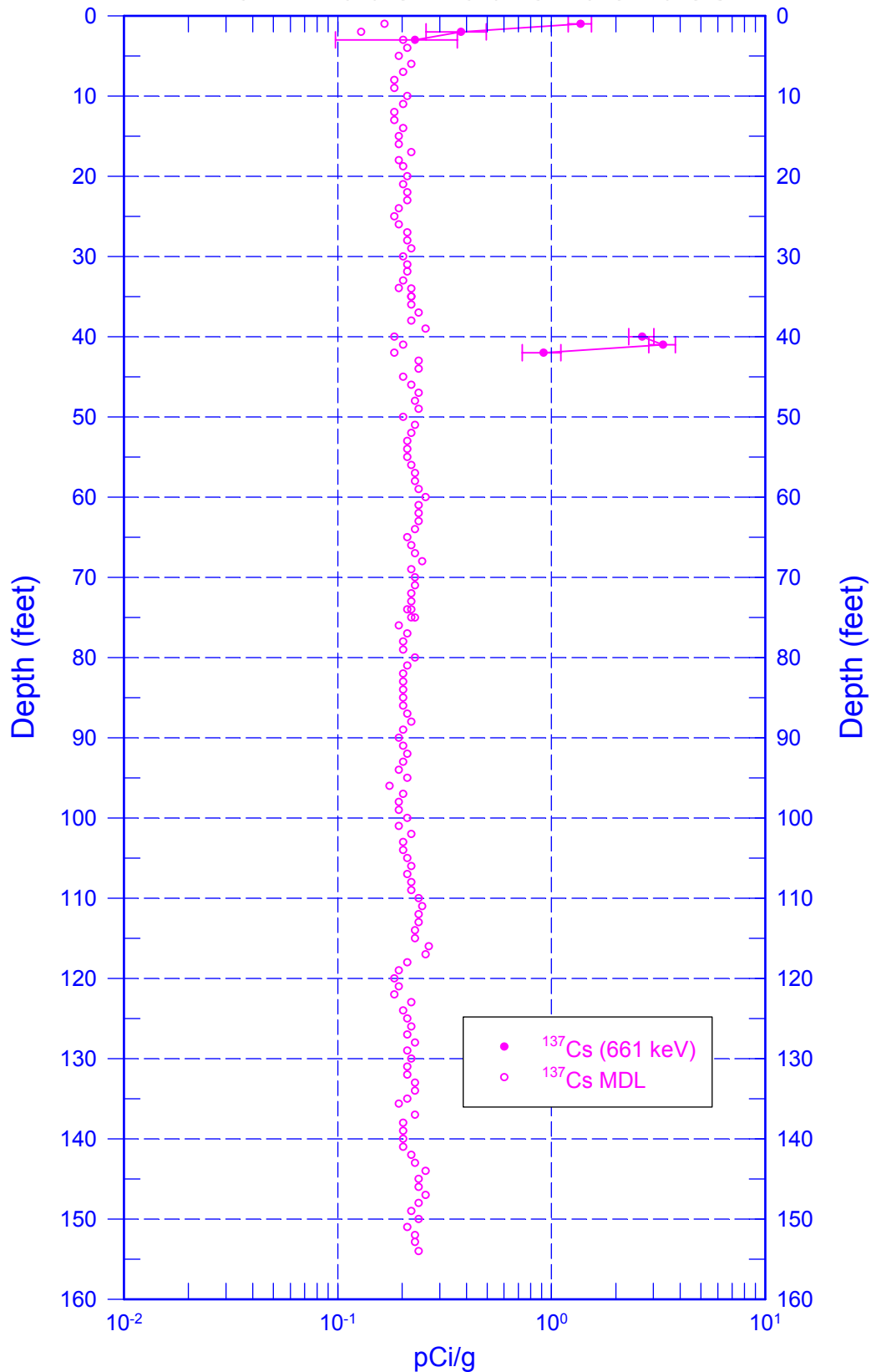


from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-W11-65, Logged on 4/26/63 and 5/6/76

299-W11-65 (A7307)

Man-Made Radionuclides

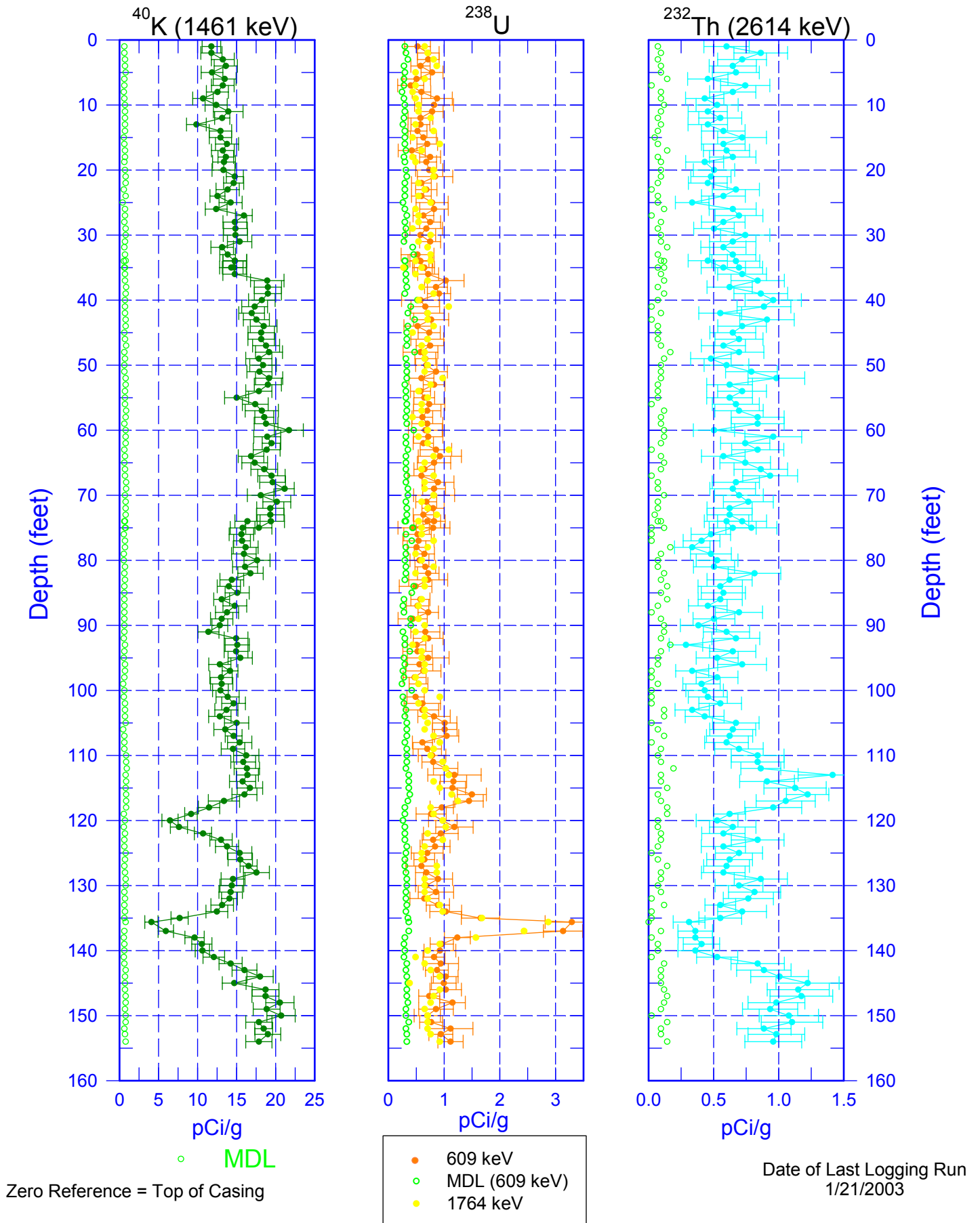


Zero Reference = Top of Casing

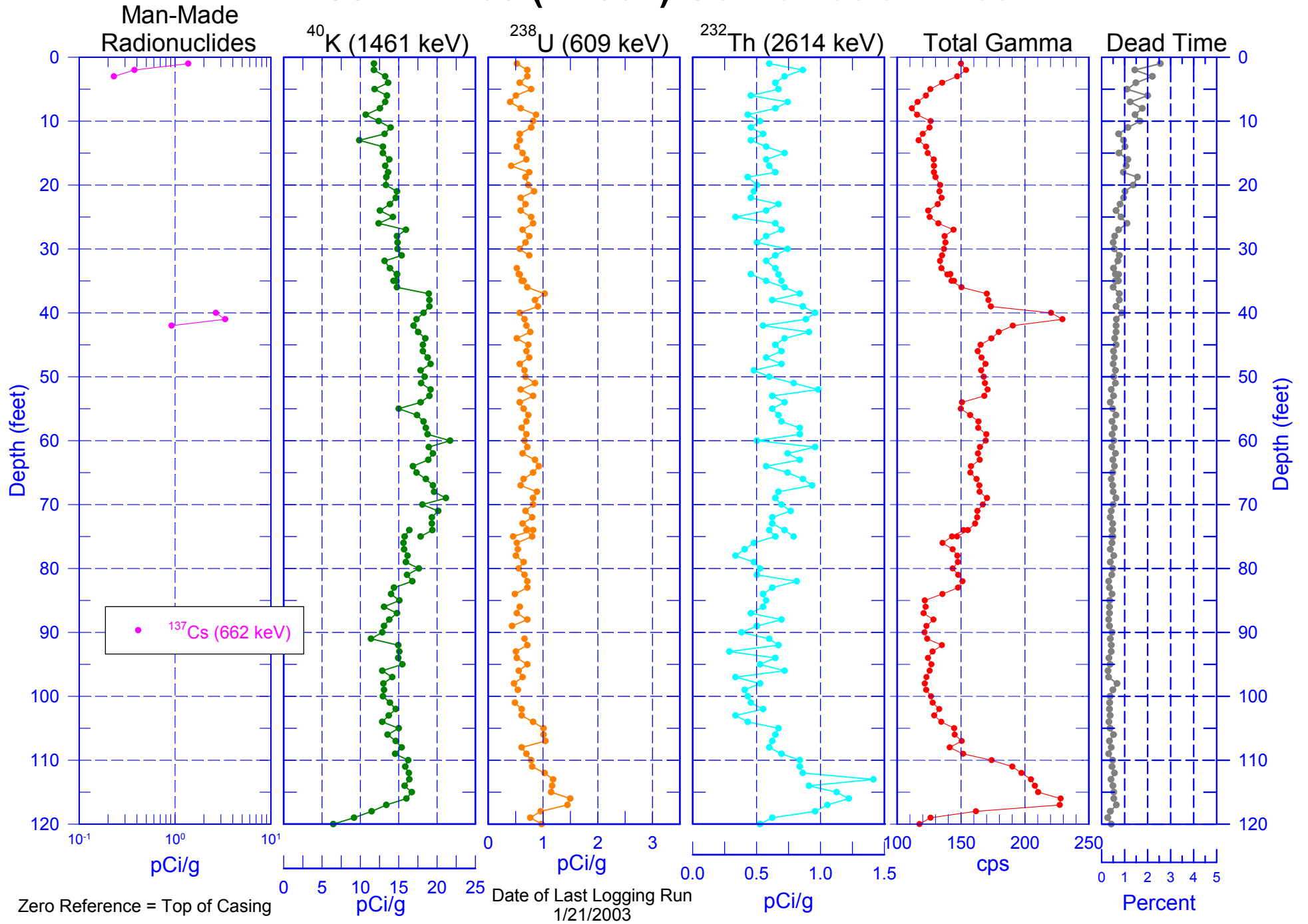
Date of Last Logging Run
1/21/2003

299-W11-65 (A7307)

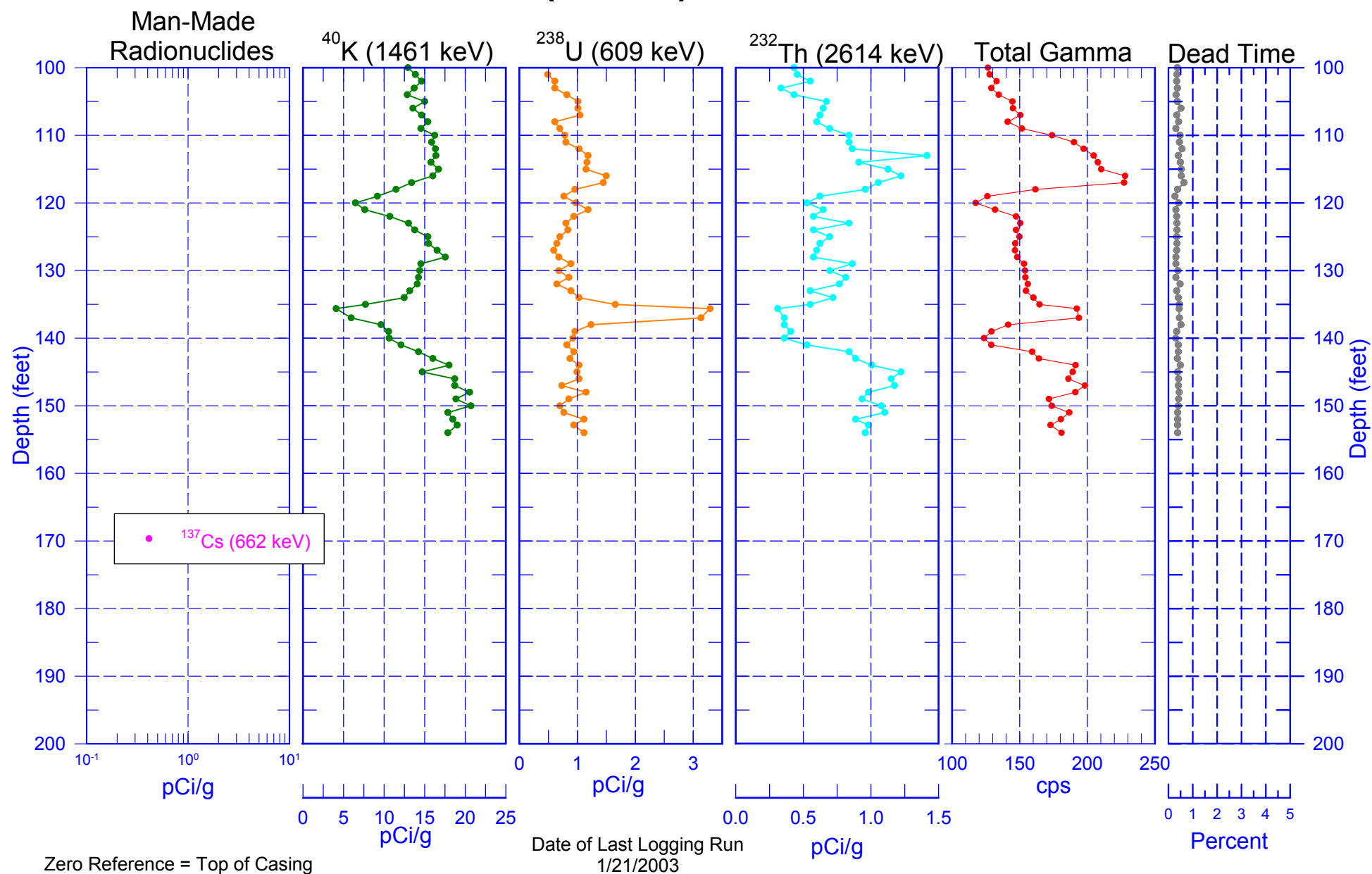
Natural Gamma Logs



299-W11-65 (A7307) Combination Plot

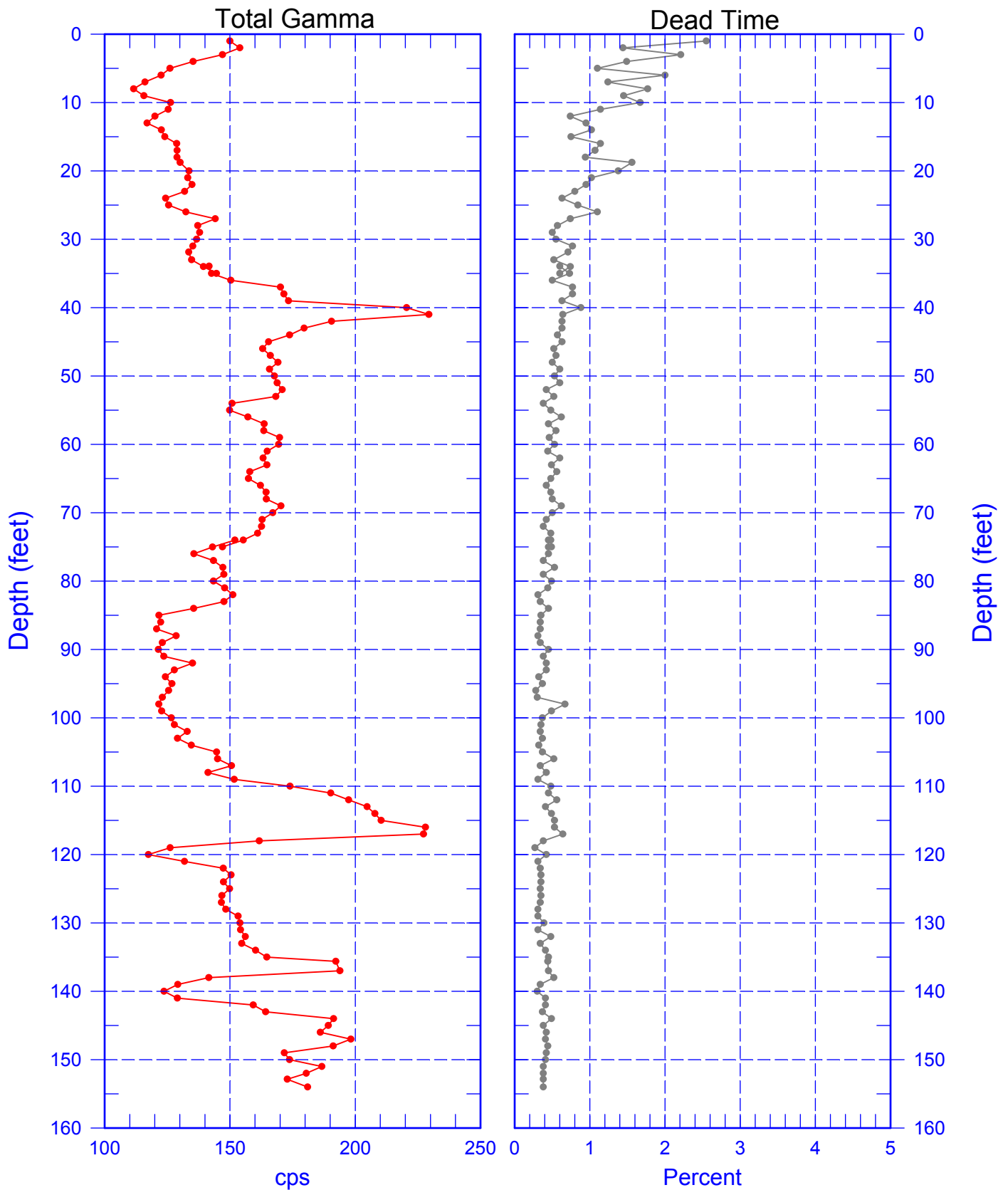


299-W11-65 (A7307) Combination Plot



299-W11-65 (A7307)

Total Gamma & Dead Time

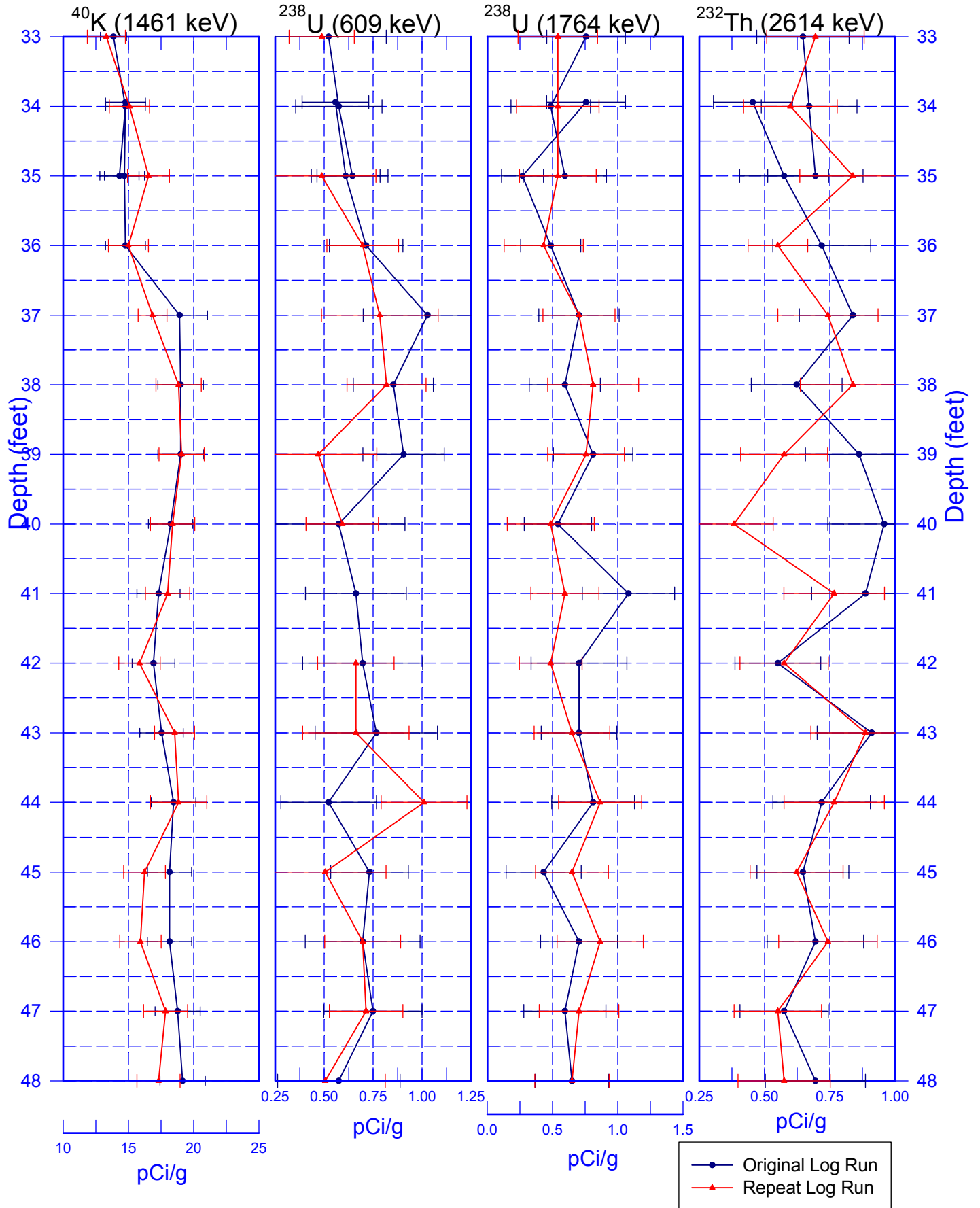


Zero Reference = Top of Casing

Date of Last Logging Run
1/21/2003

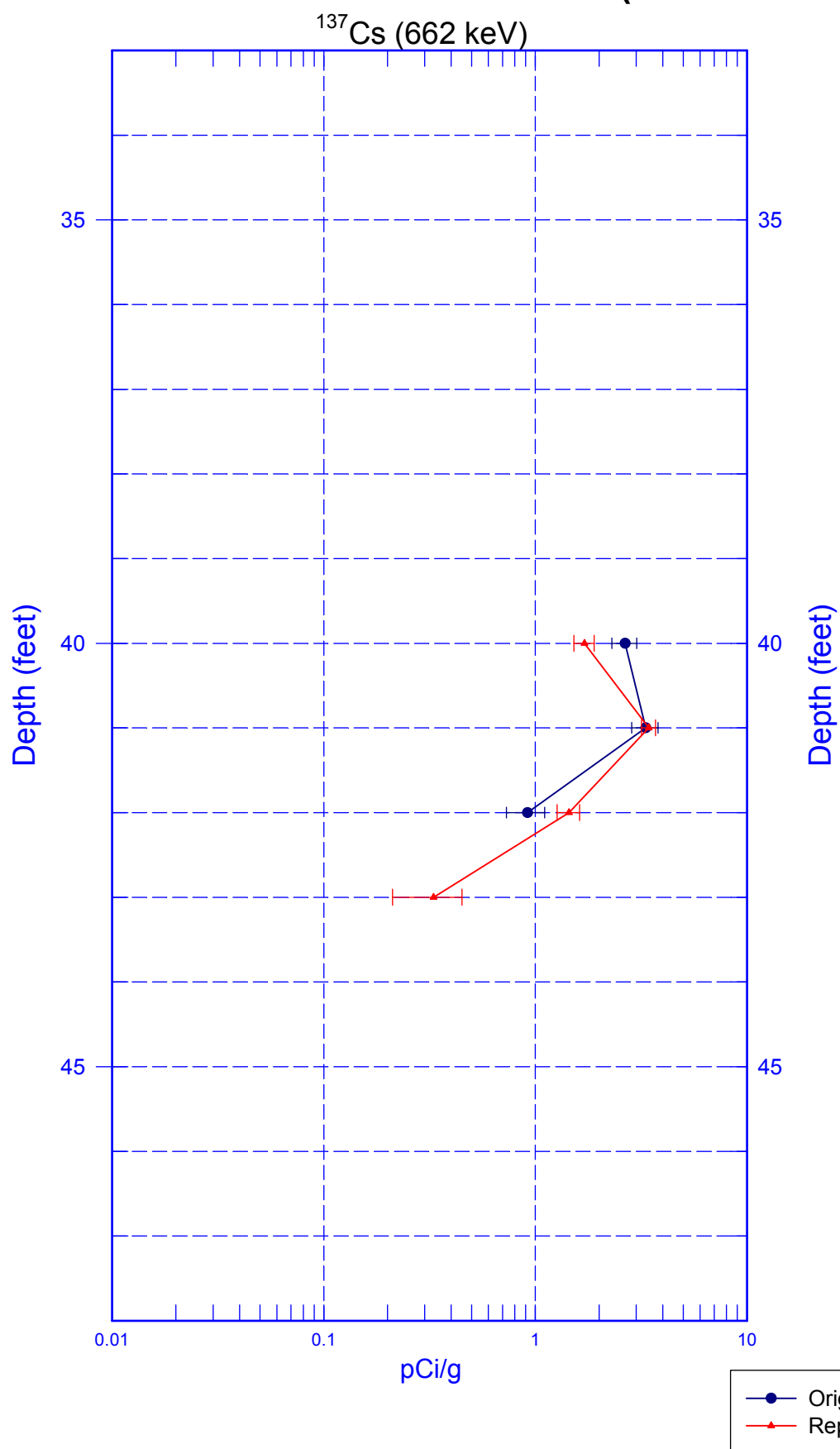
299-W11-65 (A7307)

Rerun of Natural Gamma Logs (48.0 to 33.0 ft)



299-W11-65 (A7307)

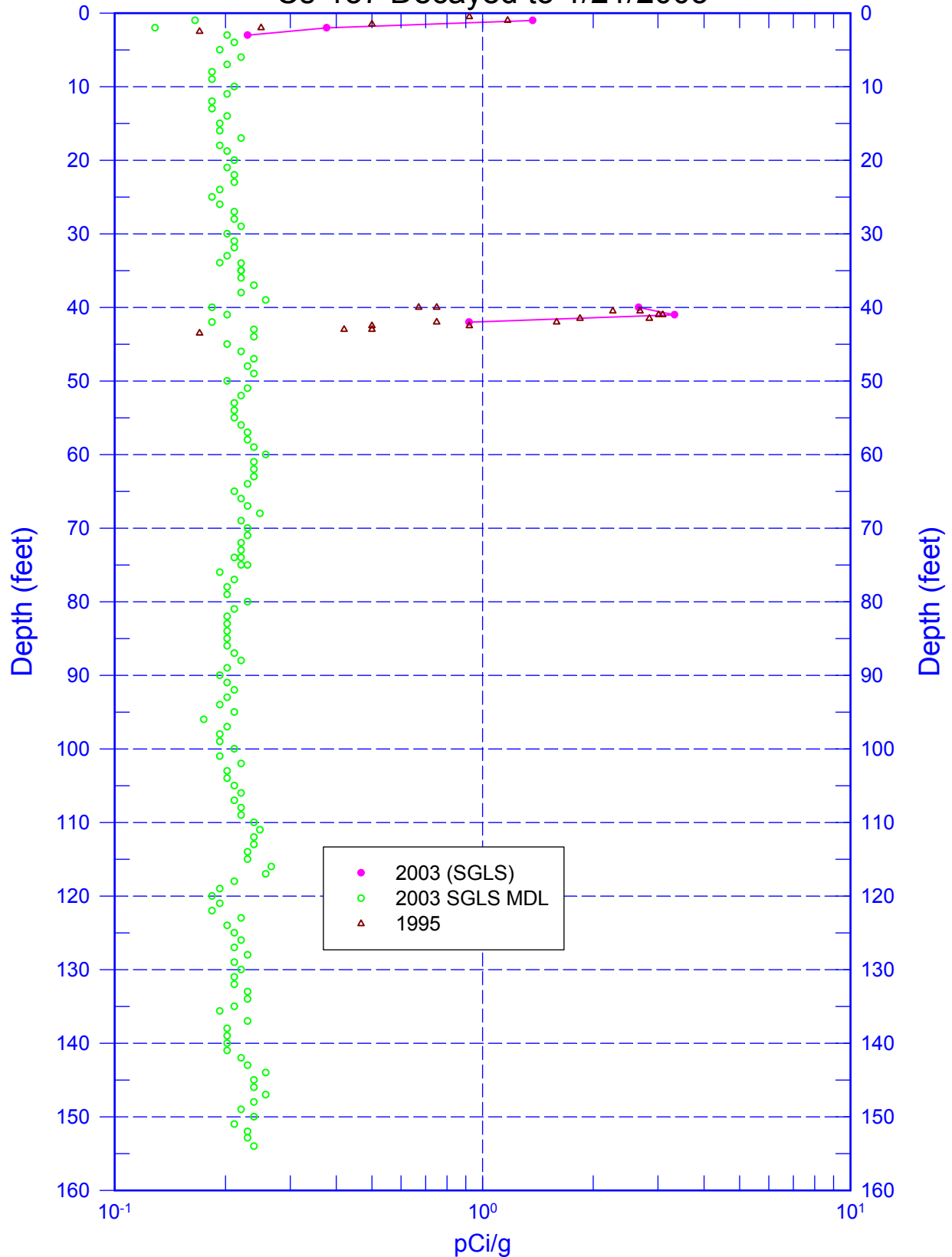
Rerun of Man-Made Radionuclides (48.0 to 33.0 ft)



299-W11-65 (A7307)

RLS Data Compared to SGLS Data

Cs-137 Decayed to 1/21/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)